

The Outlook of Emerging Technology in *Education*



Editor

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To Mary Joy Redulla (2023 coordinator) for making the study afloat and visible up until the end of the training. To the students and specialists that made significant input to this paper by providing their research findings.

WRITERS AND Faculty Partners

Joshua Vidal

Joshua Vidal is a license teacher, an educator, researcher, and leader in the field of science and technology education. Vidal holds a Master of Arts in Social Science, Master of Arts in Education, and received Doctor of Education-Honoris Causa, and now pursuing his Doctorate of Philosophy in Public Administration. Also, he is a Research Scientist Fellow at the Science Department of Unida Christian Colleges (UCC), where he leads initiatives that enhance science education through innovative research and the integration of technology. Vidal serves as the Editor-in-Chief of the Electronic Paper for Science and Technology Education, which publishes groundbreaking articles on educational innovations. His work emphasizes resilience and forward-thinking in education, with notable publications such as "Systems Thinking in Education: Its Application in a D-VUCA World" (2023), "Emerging Technologies: The Birth of Artificial Intelligence (AI) in Education" (2023), and "Propose Curriculum Planning and Management Model Towards Timely and Resilient Education Curriculum in the Philippines" (2023). His current research project, "Positive Education: Investigating Brain Plasticity and Its Effect on Academic Performance," explores how positive educational practices influence brain adaptability and enhance student outcomes.

Beyond academe, Vidal contributes to the Coastal Cities at Risk Philippines (CCARPH) project at Ateneo de Manila University, focusing on systemic resilience in education and urban sustainability. He also collaborates with many organizations like the Cavite Sky Observers, bringing hands-on astronomical experiences to students through events such as the 2022 total lunar eclipse observation. Vidal's multifaceted roles position him as a key influencer in shaping resilient, technology-driven educational strategies that prepare students and educators for the complexities of the modern world.



Mary Joy L. Redulla

A dedicated and accomplished educator and researcher, licensed professional teacher, and currently pursuing a Master of Science in Biological Sciences at Cavite State University. She graduated Cum Laude with a Bachelor of Secondary Education major in Biological Science from the same university. Mary Joy has contributed to the academic community through peer-reviewed articles and participation in various educational initiatives. She holds significant roles in professional and editorial committees, including *Árbol Magazine*, *DSBE Greenboard*, and the Science and Technology Education Coalition Philippines. Her professional experience spans across classroom instruction, curriculum development, and leadership in science education at Unida Christian Colleges, and off-school organizations like Women in Tech PH and SciTech-TPO. Mary Joy is also engaged in global and local environmental and educational projects, showcasing her commitment to fostering educational resilience and innovation.

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Lemuel Ramos

Lemuel Ramos is a dedicated science educator and former robotics specialist at Unida Christian Colleges, where he has showcased his expertise in STEM and robotics. He holds a bachelor's degree in Secondary Education, majoring in Biological Science, from Cavite State University, Silang Campus, class of 2019. Currently, Lemuel is pursuing both a master's degree in Biology and a Bachelor of Science in Computer Science. Since 2019, he has been teaching in the Basic Education Department at Unida Christian Colleges and successfully passed the Licensure Examination for Teachers in 2022.



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Joselito Asuncion Bergonia is an experienced educator with a strong foundation in Power Plant Engineering Technology, holding both a Bachelor's and Master's degree in the field. He is a Licensed Professional Teacher with expertise in teaching Earth Science, Disaster Readiness and Risk Reduction, General Physics, and Robotics at Unida Christian Colleges. With certifications in Mechatronics and Teaching Methodology, Joselito is committed to integrating technology into education to foster a dynamic learning environment.



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Aston Martin Queliza

Aston Martin Queliza is a dedicated professional teacher specializing in technology education, particularly in the development of virtual classroom laboratories for physics. He holds a Master's degree in Technology Education and a Bachelor's in Power Plant Engineering Technology from the Technological University of the Philippines. Aston has significant experience in teaching General Physics, Capstone Research, Statistics, and Business Math at the senior high school level, where he excels in both module development and synchronous/asynchronous teaching methods.



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Roan Angel E. Francisco is a passionate biology educator with a Bachelor of Secondary Education from Cavite State University. She has a diverse teaching background, having taught in various educational levels from elementary to senior high school. Currently a Senior High School Teacher at Unida Christian Colleges, Roan is well-versed in curriculum development and has undergone extensive training in STEM research, classroom management, and teacher wellness. Her teaching approach is centered on the localization and contextualization of science activities within the K-12 curriculum.



Maegan D. Concepcion

Maegan Concepcion is a passionate educator with a Bachelor's degree in Secondary Education, majoring in Biological Science, from President Ramon Magsaysay State University, San Marcelino Campus. She is a licensed professional teacher and served as a Science Teacher in the Senior High School Department at Unida Christian Colleges. In addition to her teaching duties, Maegan was the lead of the Project Investigator for Grade 11 and played a pivotal role in the school's Disaster Risk Reduction Management, focusing on enhancing disaster preparedness on the school grounds.



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Kyla Bien Cinco Sarabusab is a Licensed Professional Teacher with a strong foundation in Biological Sciences, holding a Bachelor of Secondary Education from Cavite State University and currently pursuing a Master of Science in Biology. She has garnered extensive teaching experience at institutions such as FEAPITSAT College of Dasmariñas and Unida Christian Colleges, where she handled senior high school science. Kyla is recognized for her commitment to fostering quality education and enhancing student performance through innovative strategies. Her dedication to continuous professional development is reflected in her participation in numerous seminars and workshops focused on educational innovation and research.



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Keir Nathaniel B. Nasis

Keir Nathaniel B. Nasis is a seasoned educator with over 11 years of experience, demonstrating a profound expertise in teaching and administration within the educational sector. He holds a Bachelor's degree in Elementary Education and has furthered his academic credentials with ongoing studies in a Master of Arts in Education, majoring in Educational Management. Keir is a licensed professional teacher with a strong background in robotics and computer education, having coached teams to success in national and international robotics competitions. His career is marked by a commitment to innovative teaching practices, leadership roles, and continuous professional development, including certifications in digital education, cybersecurity, and leadership. He has also served as a Discipline Officer and Grade Level Coordinator, showcasing his ability to manage both academic and behavioral aspects of student life.



Maria Carlota C. Dela Cruz

Maria Carlota C. Dela Cruz is a seasoned professional with over two decades of experience in both education and healthcare. She is a Registered Nurse and Licensed Professional Teacher, holding a Bachelor of Science in Nursing from Central Luzon Doctors Hospital Educational Institution and has pursued a Master of Arts in Education majoring in Educational Management at De La Salle University-Dasmariñas. Maria has dedicated the last 14 years to Unida Christian Colleges, where she has made significant contributions as a Science Teacher, Subject Coordinator, and Registrar. Her commitment to excellence is evident in her numerous awards, including the Outstanding Performer (Faculty) and Performance Excellence Award. Her background also includes hands-on experience as a nurse at the American Outpatient Clinic, where she developed her clinical skills. Maria is passionate about fostering a conducive learning environment and nurturing the academic and personal growth of her students.



Mary Rose Abaya

Mary Rose Abaya is a dedicated and experienced Science educator with over two decades of teaching experience across various institutions. She has been a Science Teacher at Pag-ibig Unida School since 2000, where she has honed her expertise in delivering engaging and effective science education. Her earlier roles include teaching positions at St. Perigrine Institute, Bucandala National High School, and serving as a Peer Tutor at Cavite College of Fisheries. Mary Rose is committed to continuous professional development, having earned her Bachelor of Science in Education majoring in Chemistry from Philippine Normal University, where she is also pursuing her Master's in Science Education. Her academic foundation is further strengthened by her early academic achievements, graduating with honors from both Del Pilar Academy and Anabu 1 Elementary School. Her dedication to education is reflected in her successful passing of the Licensure Examination for Teachers in 1998, marking the beginning of a fruitful career in education.



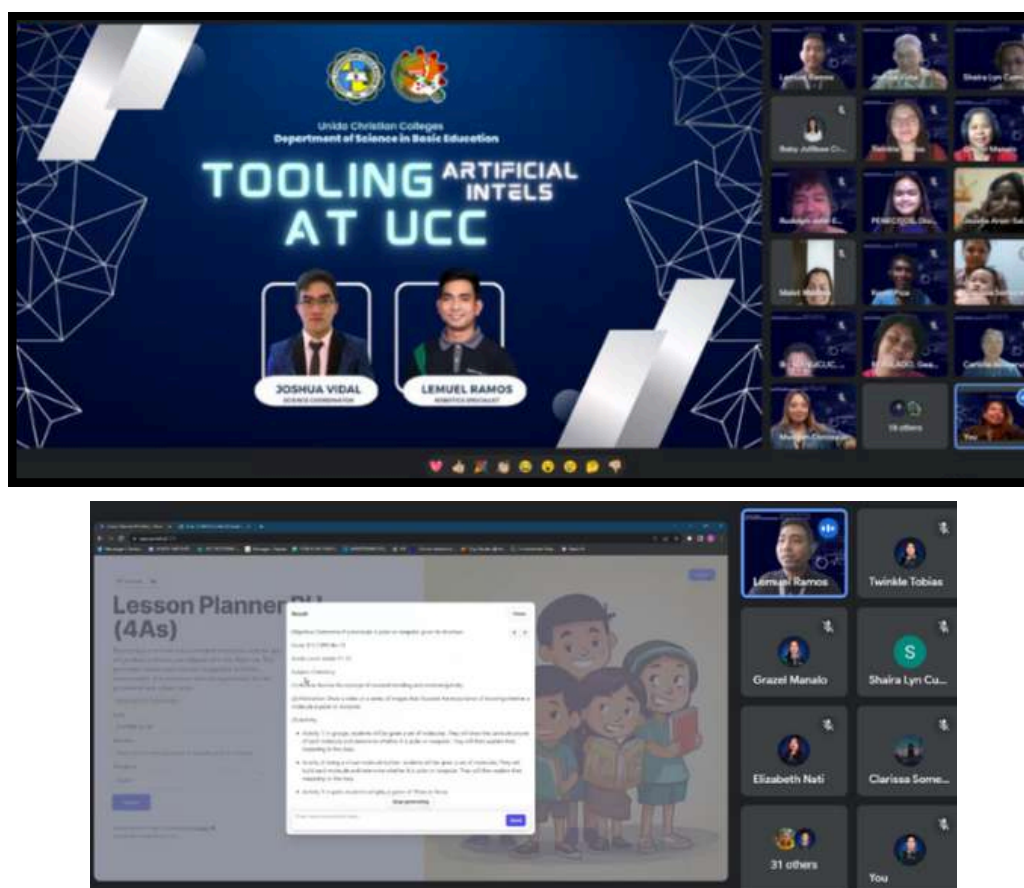
Grazel N. Manalo

Grazel N. Manalo is an accomplished and dedicated educator with extensive experience in teaching Science across various educational levels. With a strong commitment to fostering both the academic and social growth of students, she has successfully taught and motivated students in multiple institutions, including her current role as a Senior High School Teacher at Alfonso Integrated High School. Grazel holds a Bachelor's degree in Secondary Education, majoring in General Science, and has pursued further studies towards a Master of Education. Her expertise is enhanced by proficiency in modern teaching tools and techniques, such as video editing, LMS, and hybrid education, ensuring an engaging and effective learning environment.



TOOLING ARTIFICIAL INTELS AT UCC

a webinar-workshop



The morning session kicked off with a theoretical and discussion-based session on the integration of AI tools in the classroom, led by Joshua Vidal, the former Science Coordinator of Unida Christian Colleges.

Mr. Vidal explored the potential of AI as a tool for enhancing the teaching and learning experience, focusing on practical strategies for implementing AI technologies in educational settings. Additionally, Mr. Lemuel Ramos, former Robotics Specialist of Unida Christian Colleges, delved into the sphere of AI efficiency for teachers and students. This session provided insights into how AI could optimize educational processes, streamline tasks, and improve overall efficiency in the classroom. Mr. Ramos shared practical examples and case studies showcasing the benefits of AI integration.

Both speakers, Joshua Vidal and Lemuel Ramos, conducted interactive virtual workshops in the afternoon session, allowing participants to gain hands-on experience with AI tools inside the classroom. These workshops catered to the needs of both educators and students, enabling them to explore the practical application of AI technologies and understand how to leverage them effectively for enhanced teaching and learning outcomes.

TOOLING ARTIFICIAL INTELS AT UCC 2.0

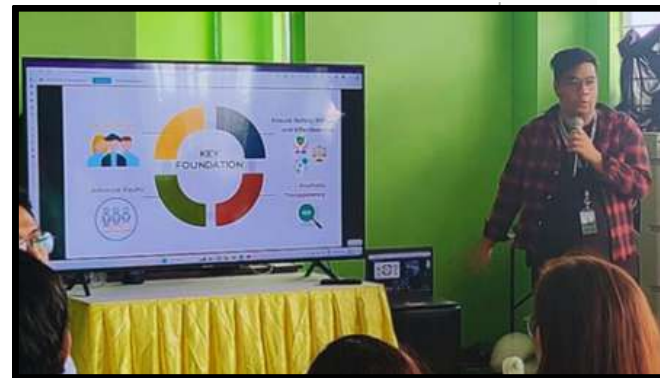


Lemuel Ramos, Robotics Specialist, started the seminar with discussing use of AI in Education

Mr Lemuel Ramos, one of the keynote speakers, discussed the AI in Education in the Philippines and shared AI websites good for creating lesson plans for our teachers.

Setting Guidelines for the Utilization of AI-Powered Tools in Classroom Instructions

Mr. Aston Queliza, a science investigator and one of the keynote speakers, discussed the guidelines that will help educators inside the UCC Community monitor student engagement when using AI-Powered tools, such as Chat GPT, to do their tasks. By setting some guidelines, teachers can now determine the extent of student utilization and interaction with Artificial Intelligence, where responsibility and accountability are not jeopardized.



Reiterating the Inevitable: From Traditional to AI-Human Driven Classroom Instructions

Mr. Joshua Vidal, the esteemed educator from a school in Indonesia, spoke and shared his expertise and valuable knowledge in innovative education through the use of AI as part of classroom instruction. He reiterated that AI is an inevitable part of the 21st century teaching and learning process, which teachers should incorporate in the face of rapidly changing educational settings.



Executive Summary

The Outlook of emerging Technologies in Education underscored the role and implications of cutting-edge technologies, tools, innovations and trends in transforming educational systems globally. This paper, edited by Joshua Vidal, MSSc, MAEd, LPT, PhD (student), attempts to contribute to academic leaders and researchers, examines the integration of Artificial Intelligence (AI), Virtual Reality (VR), Gamification, and IoT in educational settings.

This paper provides key findings that could be helpful for crafting and implementing a guide for AI in education. This, at the same time, underscored challenges such as the digital divide, privacy concerns, and the need for teachers personal development. Through case studies, this paper identified both the opportunities and limitations of technology integration in diverse educational contexts.

This report provided practical recommendations for education, policymakers, and institutions to adopt emerging technologies effectively while mitigating associated risks. This, however, ensures that technological advancements serve as a tool for engaging and classroom enhanced experience.



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INTRODUCTION

Definition of Emerging Technology

Emerging technologies have garnered significant attention in academic circles and educational policy discussions (Wang et al., 2024). However, there is no consensus on what qualifies a technology as emergent (Rotolo et al., 2015). This paper aims to define emerging technology within the educational context as a rapidly growing and impactful domain with considerable potential to transform various aspects of education, including teaching and learning processes, policy formulation, and student academic performance.

Importance of Technology in Education

The journey of technology had undeniably significant transformation across various phrases. During the pre-digital stage, the tools used were so simple like chalkboards, overhead projectors and printed textbooks. Here comes the 1980s to 1990s, the early digital era where the introduction of computers, school softwares, and minimal internet access to classrooms. These beginnings forced educational technology to keep the ball rolling by discovering electronic platforms like Moodle, and Blackboard. Early 2010s mobile devices started to surface as a potential for online collaboration, communication and learning. Now, advanced technology dominates the classrooms such as artificial intelligence (AI), virtual reality (VR), augmented reality (AR), and the internet of things (IOT) (Lee, 2020), which are driving personalized experiences and the use of data analytics to inform instruction and policy. Moreover, it is evident that technology has brought a profound impact on learning, enhancing various aspects of educational experiences (Haleem et al., 2022). Technology also improved accessibility that enables learners with challenges including those who are underrepresented people who live in remote areas to access equitable and quality education (Global Education Monitoring Report 2023: Technology in Education: A Tool on Whose Terms?, 2023).

Moreover, the team of (Chiu et al., 2023) examined the integration of AI in education systems like the following: (1) learning (2) teaching (3) assessment (4) and administration, which figured out different roles that AI play of each domain such as personalizing tasks, facilitating human-machine conversations, providing feedback, and enhancing digital interactivity in learning that leads to adaptive teaching strategies, supporting classroom management, and fostering teacher professional development (PD) in teaching that helped ease the burden of educators by automating the grading system, and predicting students performance in every assessment. The comprehensive review underscored seven student and teacher learning outcomes, including increased motivation, academic performance, 21st-century skills, non-cognitive aspects, working efficiency, teaching competence, and lastly attitudes towards artificial intelligence in education (AIED). However, it is important to have a counterpart research on AI's continued development and transformation on developing better-designed resources, effective data use, interdisciplinary AI applications and addressing teachers' mastery, perceptions and negative attitudes on the use of any artificial intelligence inside the classroom.

In addition to the review conducted by (Chiu et al., 2023), this paper identified several significant studies that will help explore the integration of and impact of artificial intelligence (AI) in education, providing both supportive and contrasting thoughts. Firstly, the study of (Chen et al., 2023) underscored the significant effect of AI in education in terms of personalized learning, adaptive assessments, and administrative efficiency which supported the study of Chiu et al.'s findings on AI's roles in personalized tasks and adaptive teaching strategies.



INTRODUCTION

Contrastingly, (Moore et al., 2023) study on AI in K-12 education, revealed that while it is true that AI tools like tutoring system gave significant effect to students' learning outcomes in mathematics per se, these tools (AI) will likely present challenges in terms of resource limitations, teachers' preparedness, likability, understanding and mastery. Secondly, (Deschênes, 2020) on the other hand, supported the idea of the potential of AI to improve student engagement and bolstering academic performance. However, (Deschênes, 2020) reiterated the risk of exacerbating the educational inequities, particularly if access to technology is unfair among students, thereby widening the digital disparities.

Furthermore, (Guan et al., 2020) conducted an interesting historical analysis on AI innovation in education; underscored the transformative potential of AI, while there's a need to note significant challenges such as data privacy, academic integrity, and a need for an interdisciplinary research approach. Overall, the studies included in this paper are believed to collectively reinforce the opportunities and challenges identified by Chiu et al., emphasizing the need for further study to address ethical concerns, enhance teachers' training, and ensure equitable access to AI technologies in education (Chen et al., 2022; Moore et al., 2023; Deschênes, 2020; Guan et al., 2020).

Purpose of the Report

Evaluating the effectiveness brought about the technologies is worth-studying and for it to be achieved it takes a multi-faceted approach to holistically bring out solutions to the problems we face in the educational system. Survey, teacher-student feedback, webinar, training were utilized in this report to get comprehensive evaluation.

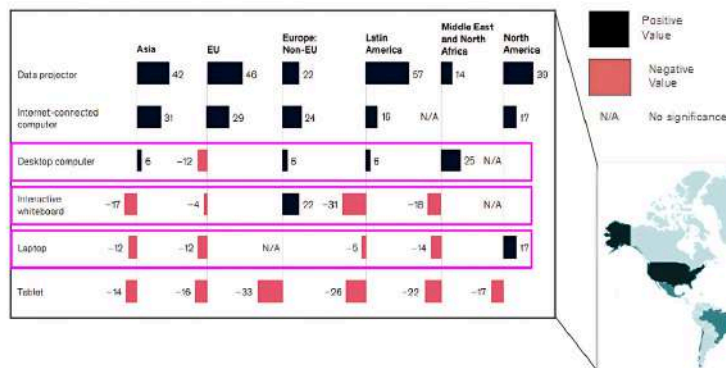


CURRENT LANDSCAPE OF EDUCATIONAL TECHNOLOGY

The Global Look for Technology in Education

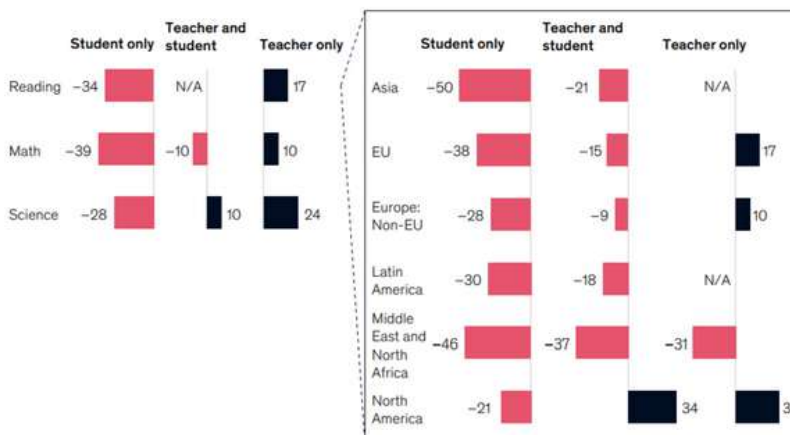
Source: OECD PISA 2018

Positive values (dark blue) indicate that utilizing the technology is related with greater reading results than not using it. Negative values (in reddish) represent lower scores when the technology is utilized



As digital education technology continues to evolve it will definitely leave an undeniable mark in the lives of teachers and students. For example, interactive whiteboards hang in the place of chalkboards, and students use laptops and schools investing in virtual realities. The report of (OECD PISA, 2018) which revealed that using technology in education can lead to many possible outcomes; it could be higher reading scores, with positive numbers indicating higher scores. Conversely, negative numbers indicate lower scores. For instance, in Asia, using a data projector leads to 42 points higher reading scores, while an interactive whiteboard results in 17 points lower scores. In the EU, data projectors lead to 46 points higher scores, while tablets result in 16 points lower scores (see other comparison in the figure above). However, some technology is not statistically significant, indicating uncertainty in its impact. This study can signal teachers and school leaders that the use of technologies vary on the capability, need, and readiness of a teacher, students, parents and an institution in general.

Moreover, exclusive use of devices by students is associated with significantly lower outcomes everywhere.



Source: OECD PISA 2018

The chart compares the impact of using digital devices on students' PISA scores, indicating a decrease in scores when used by the student alone, teachers alone, or both. The chart shows that students' scores dropped by 34 points, math by 39 points, and science by 28 points when using devices alone. Teachers used the devices alone, resulting in a positive impact on all subjects, with reading scores increasing by 17 points, math by 10 points, and science by 24 points. The chart also shows regional impacts on reading scores, with Asia showing the largest decrease of 50 points. In the EU and Non-EU Europe, reading scores increased by 17 and 10 points, respectively. The best outcomes are seen when teachers use the devices, especially for reading in North America, and the worst outcomes are when students use the devices alone, especially in Asia.



CURRENT LANDSCAPE OF EDUCATIONAL TECHNOLOGY

Closer Look to Emerging Technologies inside the classroom: Chatbot and Google Workspace

Teaching is a vocation that is mainly disconnected from the fast-paced changing world of digital progress. During the pandemic education sector was one of the sectors experiencing system shocks for a major shift in delivering blended learning (Vidal, 2023) resulted with overworking teachers remaining one of the issues in education. During the shocks, instead of preparing lessons for the class, educators are occupied with indirect related loads to the teaching (Education World, n.d.) for example, checking and recording, both the formative and summative, works of students as one of the time-consuming aspects of teaching career. Finally, the lessons were drawn by developing smart and online-based digital education that incorporated the GSF-VlookUp formula, Google forms, Google spreadsheets, Chatbot (using manychat of messenger).

How to set-up the digital classroom incorporating chatbot and google workspace?

First, using Google Site we can make a simple, free and, convenient website where all our pages can house and function. Google site is a user-friendly web creation tool offered by google. It allows users to launch their own website without needing advanced technical skills. The site also provides a range of features, including customizable templates, drag-and-drop functionality, integration with other google workspace features like google docs, sheets, and slides, and the ability to add different multimedia content such as the embed of videos from youtube or even from personal recordings. Users can also collaborate in real-time, making it ideal for a classroom and any other educational purposes.

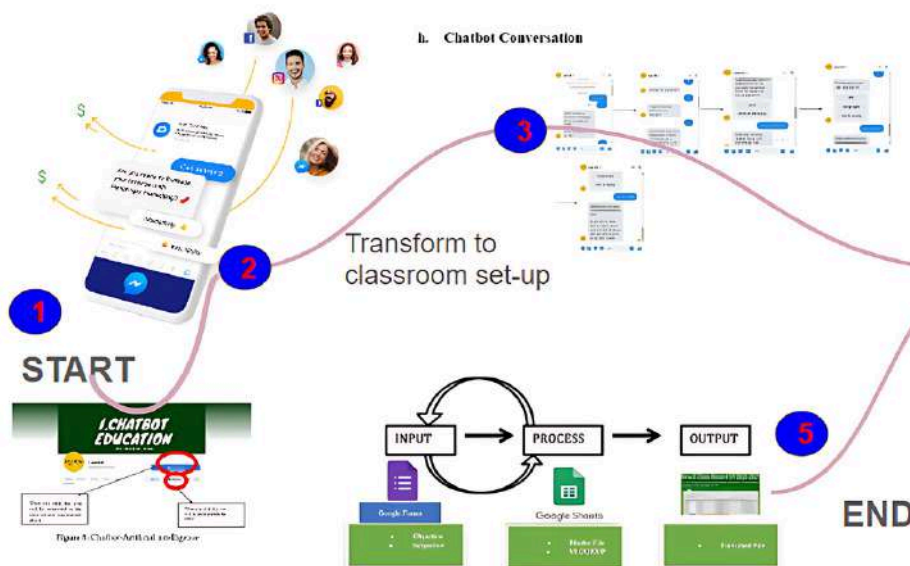


Figure 1. Vidal, J. (2021). Framework on having an Effective E-Recording-Integration of Google Forms and Google Spreadsheets using VlookUp

Source: from the author

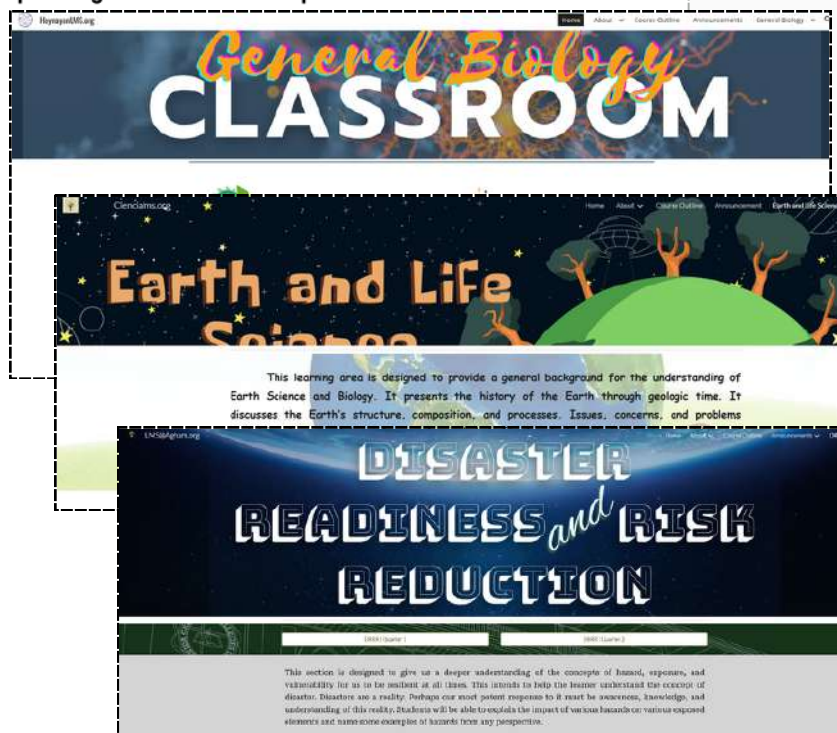
To begin, select a preferred template that best fits the audience, let us say for instance your science classroom, however take note that you can also start from a blank template where you are free to create your own style. The intuitive interface allows you to add pages, embed content from google applications, and arrange your layout with ease. This makes it possible to create a cohesive and visually appealing digital space for your students.



CURRENT LANDSCAPE OF EDUCATIONAL TECHNOLOGY

In education, Google Site can function as a dynamic digital classroom. Educators can utilize the pages to house lesson plans, distribute assignments, publish announcements, and provide resources for students. Each page can serve a different purpose—such as a syllabus page, a homework submission page, or a discussion forum. The seamless and convenient integration with google workspace tools allow for easy sharing of documents, spreadsheets, and presentations, facilitating a collaborating digital space for learning. With google sites, teachers can create a centralized hub for all classroom activities, enhancing communication and accessibility for both the teacher and students.

Sample Google Sites under the Department of Science in Basic Education



Source: onescience.org (Science Department of Unida Christian Colleges)

Second, while the website and the facebook page were in place, the researcher incorporated ManyChat to enhance student interaction and support. ManyChat is a robust platform designed to create chatbots* for various messaging apps, including Facebook Messenger. Automated messaging (AM) is also one of its best features for interactive conversation flows**. Another feature it could offer is to handle frequent questions from students, provide lesson summaries, and offer guidance on missed topics. This AM ensured that students receive timely responses and support, wherever and whenever improving learning experience. Moreover, students can follow up on the lessons based on the inquiries via the chatbot. Once the students completed the activities and assessments thorough Google Forms***. One best feature of Google Form is its real-time responses tracking, easing sharing via link or email, and seamless integration with other Google Workspace tools. Furthermore, for the objective type of test, scores are automatically calculated (given the teacher sets the correct answers) and sent to a linked Google Spreadsheet, providing immediate feedback to students. Although the subjective type of test responses can still be submitted through Google Forms, students' scores must be manually checked and marked as "done" once checked.



CURRENT LANDSCAPE OF EDUCATIONAL TECHNOLOGY

Third, Google spreadsheet will be teachers' data warehousing in managing and analyzing students' scores. One of its functions is to organize data, real-time collaboration, and various analytical tools. The VLOOKUP formula, which stands for Vertical Lookup, is used for searching for a specific value in the first column of a range and returning a value in the same row from a specified column. For example, VLOOKUP can help automate the retrieval of students' scores based on their names or IDs, significantly reducing the manual effort required for score compilation. By using VLOOKUP teachers can quickly and accurately update students' records, making the process more efficient and less prone to errors.

Finally, combining Google Site, ManyChat, Google Forms, and Google Spreadsheets can create a conducive and efficient digital learning environment. This digital set-up allows for seamless communication, streamlined assessment processes, and effective data management, ultimately enhancing the teaching and learning experience of both the teachers and the learners.

** Chatbot is a special program designed to simulate conversation or inquiries from a user especially over the internet*

*** Automated Messaging is integrated with Natural Language Processing (NLP) to experience huma-like experience conversation. Furthermore, artificial intelligence was also successfully integrated in this feature to advance conversation and to level-up different domains by having valuable feedback collection.*

**** Google form is a versatile tool that can create surveys, quizzes, and forms easily. One of its features include multiple question types, customizable themes, and automatic data collection.*



INTERACTION WITH ARTIFICIAL INTELLIGENCE (IAI) IN EDUCATION

The birth of artificial intelligence has brought considerable attention to multifaceted fields including the education sector in ways that the process will be seamless, and time-efficient. The term Artificial Intelligence was first coined by

John McCarthy in an academic event held at Dartmouth College, USA (Russel & Norvig, 2010, p. 17) which reiterated that “All AI researchers should be concerned with the ethical implications of their work” (pp. 1020).

	Familiar Technology Capabilities	Future Technology Capabilities
Input	• Typing	• Speaking
	• Clicking and dragging	• Drawing
	• Touching and gesturing	• Analyzing images and video
Processing	• Displaying information and tasks	• Assisting students and teachers
	• Sequencing learning activities	• Planning and adapting activities
	• Checking student work	• Revealing patterns in student work
Output	• Text	• Conversations
	• Graphics	• Annotating and highlighting
	• Multimedia	• Suggesting and recommending
	• Dashboards	• Organizing and guiding

Figure 1. Features of future technologies

Source: Office of Ed Tech

The figure above provided the differences between technology and any other emerging technologies capabilities as it transforms life to be easy and efficient. From the familiarity of typing to speaking, clicking, and dragging to drawing, touching, and gesturing to analyze images and videos to assist teachers and students learning more interactive.

The Conversational Artificial Intelligence (CAI)

Conversational AI like ChatGPT has received considerable attention due to its potential to enhance personalized learning experience for students. Scholars have drawn findings suggesting that AI can provide tailored educational support by interacting with students in real-time and adapting to students' individual learning needs. This personalization is found to be effective in accommodating various learning paces and styles, making education more accessible and engaging.

Notably, (Adiguzel et al., 2023) highlighted that ChatGPT can significantly improve personalized learning through providing instant responses and tailored feedback, which helps in accommodating various learning tempos and approaches. This innovation is crucial in imagining a more inclusive learning environment where students can receive equal support in their preferred language which they would tend to learn effectively (Mohebi, 2024; Bettayeb et al., 2024). Below are the conversation prompts shown by (Vidal, 2023) in the paper titled Emerging Technologies: The Birth of Artificial Intelligence (AI) in Education.



INTERACTION WITH ARTIFICIAL INTELLIGENCE (IAI) IN EDUCATION

- 1 The researcher: *AI do you know how to speak bisaya/Visaya?*
- 2 ChatGPT: *Yes, I can understand and respond in Bisaya. How can I assist you in Bisaya?*
- 3 The researcher: *Unsa na may istado sa atong ekonomiya karon sa pilipinas? (What is the current status of our economy in the Philippines?)*
- 4 ChatGPT: *Sa kasagaran, ang ekonomiya sa Pilipinas nagpakita og kusog nga pag-uwiag sa pipila ka mga sektor sa hinggil nga krisis sa COVID-19. Gipakita sa mga datos nga nagpadayon ang pagdugang sa gross domestic product (GDP) sa Pilipinas sa sulod sa mga nagkalain-laing mga quarter sa 2021. Apan bitan pa sa kusog nga pag-uwiag sa GDP, adunay mga hamuon problema sa ekonomiya sa Pilipinas. Ang unemployment rate nagpadayon nga taas, ug daghan kaayo ang nawad-an sa trabaho tungod sa epekto sa COVID-19. Ang mga negosyo, partikular sa mga SMEs, adunay mga kakulangan sa kapital ug gipugngan sa mga pamaagi sa pandemya. Ang Pilipinas usab nag-antos sa taas nga inflation rate sa nagkalain-laing mga buwan sa 2021, nga nagrugod sa pagpadayon sa taas nga presyo sa mga hilait. Sa sumbanan, ang ekonomiya sa Pilipinas adunay mga hamuon problema ug mga pagsulay, apan adunay mga positibo nga mga senyales sa pagpakuog sa mga sektor ug sa GDP.*

The Conversational A.I.

...I challenged the AI to translate it into English because, as we all know, being able to translate one language to another—especially into your mother tongue—would make you a more effective communicator.”

Source: from the Author

Note: ‘Visaya’ is one of the Philippine mother tongues that is majority used in Visayas region and some parts of the island of Mindanao. Read further on the conversation here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4512063, (pp. 4-5).

Furthermore, studies suggest that the benefits of integrating AI as personalized learning will improve students’ academic outcomes, enhance engagement, and provide immediate assistance. On the same hand, the integration of chatbot as an early stage of AI-conversational learning can act as the tutors, offering explanations, answering queries, and providing additional resources, thereby allowing learning opportunities beyond traditional classroom setting (Baidoo-Anu & Leticia, 2023; Yilmaz & Yilmaz, 2023). This not only aids in better knowledge retention but encourages critical thinking by giving students diverse perspectives and cutting-edge problem-solving methods (Lo, 2023).

The Use of ChatGPT for Teacher’s Lesson Planning

In today’s generation, leveraging the use of Artificial Intelligence tools like ChatGPT for teacher’s lesson planning has become increasingly relevant, as this tool claims to be significantly streamlining the process, enhancing the quality of educational content, and providing insightful ideas to educators.

Enhancing Content Quality

ChatGPT can also contribute to the quality of educational content. Textbooks, and any other printed materials for learning remained an issue to be inaccessible for teachers’ lesson planning. But by accessing the vast array of information through ChatGPT this is totally of help for teachers and students (Villasenor, 2024).

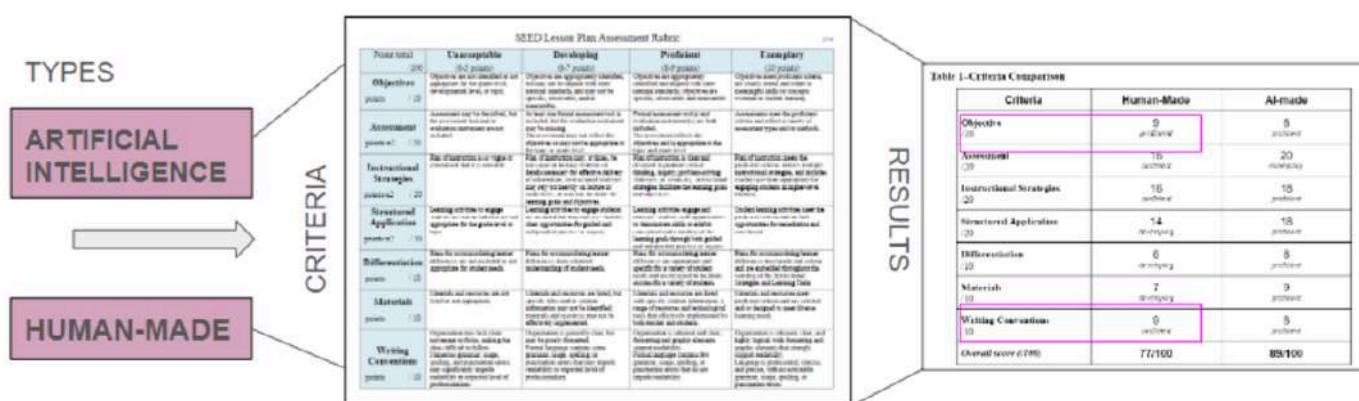
Strengthening Support and Resources

Another critical advantage of using ChatGPT is the support it offers to teachers. The AI can assist teachers’ by generating resources such as worksheets, quizzes, and multimedia content that are suitable for the lesson. This way can help reduce time that the teachers spend searching on the internet. Moreover, ChatGPT can interestingly offer differentiated instruction, ensuring that everyone is included, especially those with special needs or in varying proficiency levels (Shloul et al., 2024).



INTERACTION WITH ARTIFICIAL INTELLIGENCE (IAI) IN EDUCATION

What makes this tool reliable for making lessons? Well, efficiency is the main course of what ChatGPT can offer to the table. It is not a secret that teachers spend considerable time creating and preparing lesson plans to make sure that the teaching-learning process is on-track the moment the teacher steps foot inside the classroom. ChatGPT can expedite this process by generating detailed lesson outlines based on specific topics, for example, Human Evolution, ChatGPT will help you outline the daily lesson with the best suggested activity it thinks to be the best suited for the topic of the day. Another process it can do is creating the educational standards, both performance and context-based, on the grade levels you provided on the prompts. Imagine this tool can pave the way of stress for teachers and will be able to work on what matters most for the students which is by helping students understand the most challenging part of the lessons.



Source: The author (paper linked below)

The figure above was a simple analysis of lesson plans by both humans and AI using SEED Lesson Plan Assessment Rubrics conducted by (Vidal, 2023), revealing various strengths and weaknesses based on the subject area. This analysis revealed that AI demonstrated higher proficiency in several key aspects: instructional, strategies, structured application, differentiation, and materials, and also got an exemplary score in terms of assessment quality. However, the human-made lesson plan excelled higher in two critical areas: lesson plan objectives, and writing conventions. The findings of this evaluation reiterated the importance of clear and well-defined lesson objectives while the coherency must be in place all across the subject matter. This study argued that human expertise in setting the goals and objectives for the lesson must ensure its purpose to explicitly align with broader educational goals. Additionally adherence to writing conventions by human educators contributes to the clarity and professionalism of the lesson plans. On the flip side, however, one notable strength AI can offer is its ability to be flexible in shifting lessons from face-to-face to an online learning environment, in which a lot of educators find it so hard to do during the paramount of covid-19 pandemic, as education sectors treated education no way but a physical environment, therefore, lesson plans were drawn for face-to-face set-up (read here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4512063, (pp. 8-13).

This flexibility showed AI's potential to be of educator's help as an invaluable tool in contemporary education.



VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

Virtual Reality in Education (VRE) poised significant attention in the education arena as it showed significant enhancement to educational outcomes by providing immersive and interactive learning experiences. Studies suggest that Virtual Reality (VR) can improve learners' engagement, motivation, and retention of complex information by establishing realistic simulations that are otherwise difficult or impossible to experience in a traditional classroom setting.

The Use of Virtual Reality Box in Science Information Retention among Selected Grade 11 STEM Students



Table 1. Pre-test and Post-test Scores of Students in the Control and Experimental Group

Traditional (Control) Group Test Scores		
Score Ranges	Classification	
	Pre-Test	Post-Test
1-5	3	1
6-10	15	3
11-15	19	13
16-20	13	19
21-25	3	17
26-30	0	0

Virtual Reality (Experimental) Group Test Scores		
Score Ranges	Classification	
	Pre-Test	Post-Test
1-5	9	0
6-10	20	2
11-15	37	7
16-20	16	45
21-25	2	26
26-30	1	5

Paired Samples
Control vs. Experimental Group
p-value
<0.001
Decision
Reject H0
Interpretation
Significant difference detected

Note: H0 (Null Hypothesis) suggests no difference between groups. The test significance level is $\alpha = 0.05$.

Source: (Castillo et al., 2023)

For instance, a study investigating the impact of VR on science education revealed that students using VR technology scored significantly higher on the posttest compared to those who used traditional teaching methods, which strongly indicates that there is an enhanced retention of scientific information (Rojas-Sánchez et al., 2022). The immersive nature of VR allows students to interact with manipulative virtual objects, facilitating a deeper understanding of the material (Virtual Reality: Could It Be the Next Big Tool for Education?, 2021).

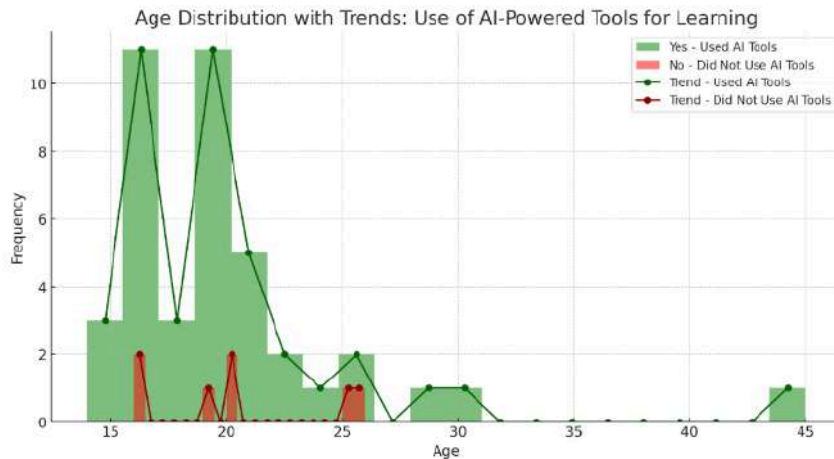
Furthermore, VR's applications in education extend beyond science. In fact, it has been effectively used in nursing education to develop practical skills. For example, nursing students who used VR simulations for emergency medical training reported improved confidence and competence in handling real-life situations (Liu et al., 2023). These findings suggest that VR can provide a safe, risk-free platform for practicing procedures and conducting experiments, which is particularly notable in fields where life is more important than the findings of science itself.

Finally, it is evident that the integration of VR in education curriculum is one possible variable to consider in revolutionizing teaching methods because of its engaging, immersive learning experiences that traditional methods may not achieve as effectively. Indeed, future research on exploring VR's potential is worth considering to address educational disparities, ethical considerations associated with its use (Rodolico & Hirsu, 2023).



VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

Perceptions of Diverse People towards the use of AI-powered tools for learning



Age Distribution with Trends - Use of AI-Powered Tools for Learning

Source: (The author, Survey, 2024.)

Axes Explanation:

- Y-Axis (Frequency): This shows how many people fall into each age category for the respective use or non-use of AI tools.
- X-Axis (Age): This represents the age of survey respondents.

Data Interpretation:

- Green Area (Used AI Tools): The height of the green bars indicates the number of people in each age group who reported using AI-powered tools for learning.
- Red Area (Did Not Use AI Tools): The height of the red bars indicates the number of people in each age group who reported not using AI-powered tools for learning.

Trends: The green and red lines show the trend for users and non-users, respectively.

Observations

1. The usage of AI-powered tools for learning is higher among the younger age groups, particularly between 15 and 25 years.
2. There is a noticeable peak in AI tool usage in the age groups around 15-20.
3. The frequency of non-users is lower, but the red trend line indicates that non-use is relatively consistent across age groups with a slight increase in the early 20s.
4. Usage starts to taper off after age 25, with a noticeable decrease as age increases.

Important Note:

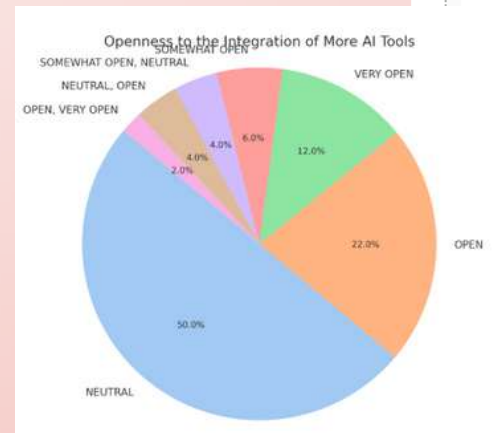
Correlation does not imply causation: Other factors, such as access to technology, familiarity with AI tools, and overall comfort with technology, could influence these results.

Openness to the Integration of More AI Tools

Source: (The author, Survey, 2024.)

Pie Chart Segments:

- Neutral (50%): Half of the respondents are neutral towards the integration of more AI tools in learning.
- Open (22%): A significant portion of respondents are open to more AI tools.
- Very Open (12%): These respondents are very open to integrating more AI tools.
- Somewhat Open (6%): These respondents are somewhat open to the idea.
- Somewhat Open, Neutral (4%): These respondents are leaning slightly towards openness but remain somewhat neutral.
- Neutral, Open (4%): These respondents are neutral but leaning towards openness.
- Neutral, Open (2%): These respondents show a slight preference towards being open to AI integration.





VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

Summary:

1. The majority (50%) are neutral, indicating neither strong support nor opposition to the integration of AI tools.
2. However, a significant positive outlook is present, with 34% (22% Open + 12% Very Open) actively endorsing AI integration.
3. An additional 16% show a slight inclination towards openness, suggesting a potential for increased acceptance in the future.

Overall Explanation:

The age distribution graph on the left shows that younger individuals, particularly those between 15-25 years, tend to be likely to use AI-powered tools. This trend, however, diminishes as age increases. It is important to note that this pattern might be influenced by factors such as technological access and comfort with new tools rather than age alone (Chu et al., 2023).

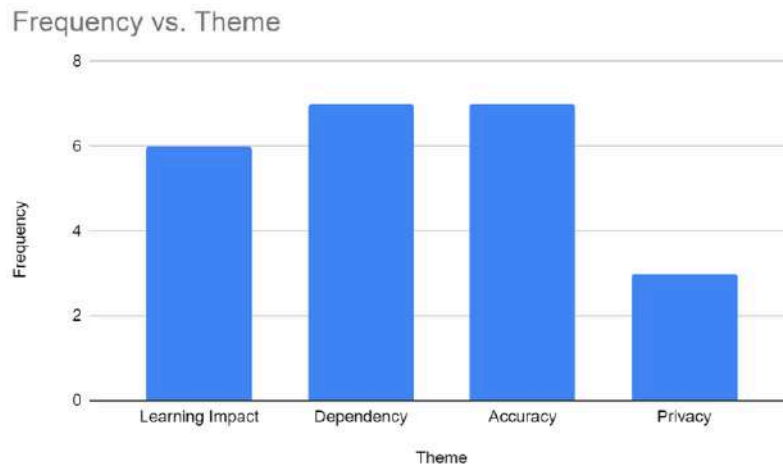
On the right, the pie chart demonstrates a generally positive outlook towards the integration of AI tools in learning. While half of the respondents are neutral, 34% show strong support (Open and Very Open), and another 16% expressed some openness. This data suggests a promising future for AI tool integration in educational settings, with a substantial portion of the population either supportive or potentially persuaded towards increased usage of AI in learning.

Finally, these results provide a snapshot of current attitudes and usage trends concerning AI tools in education, highlighting both the enthusiasm among younger users and the potential for broader acceptance across different age groups.



VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

Themes of concern on AI



Source: The author

Axes Explanation:

- Y-Axis (Frequency): This shows how many times each theme was mentioned or noted as a concern.
- X-Axis (Theme): This lists the different themes or concerns related to the use of AI in education.

Themes and Frequencies:

- Learning Impact: Mentioned 6 times.
- Dependency: Mentioned 7 times (highest frequency).
- Accuracy: Mentioned 6 times.
- Privacy: Mentioned 3 times (lowest frequency)

Detailed Interpretation:

- **Dependency:** The highest frequency indicates that the most significant concern is the potential dependency on AI tools. This reflects worries that students and educators might rely too heavily on AI, potentially reducing independent thinking and problem-solving skills.
- **Accuracy:** Also a major concern, this highlights worries about the reliability and correctness of AI-generated information. Misinformation or errors from AI tools could negatively impact learning outcomes.
- **Learning Impact:** This concern is about how AI tools might influence the overall educational experience. There is apprehension that AI could hinder student development and critical thinking if not used appropriately.
- **Privacy:** Although mentioned less frequently, privacy is still a notable concern. This involves the security and confidentiality of personal data when using AI tools in education.

The chart illustrates the frequency of different concerns related to the use of AI in education. Dependency on AI tools is the most frequently mentioned concern, indicating that many worry about over-reliance on these tools, which might stifle independent learning and critical thinking skills. Accuracy is another major concern, as the correctness and reliability of AI-generated information are crucial for effective learning. If AI tools provide inaccurate information, it could lead to misunderstandings and misinformation (Research Guides: Artificial Intelligence (AI) and Information Literacy: What Does AI Get Wrong?, n.d.). The impact of AI in learning is also a significant concern. There is apprehension that while AI can enhance learning experiences, it might also hinder student development if not integrated thoughtfully into the educational process (Li et al., 2024). Privacy, although mentioned less frequently, remains an important issue. The use of AI in education necessitates careful handling of personal data to ensure that privacy and security are maintained.

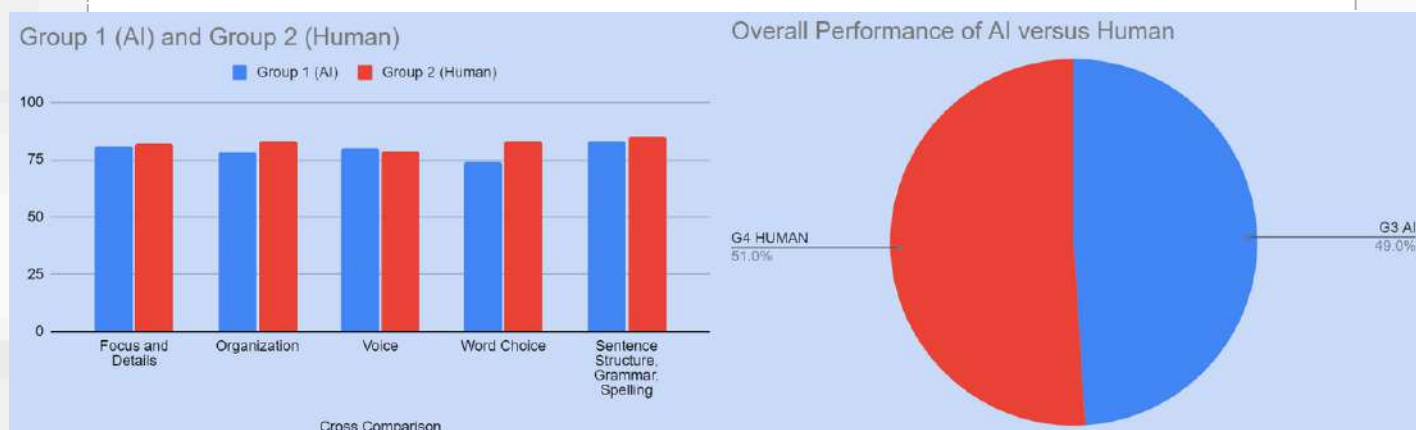


VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

While AI offers many potential benefits for education, these concerns highlight the need for careful consideration and management to maximize positive outcomes and minimize potential drawbacks (Artificial Intelligence: A Modern Approach, 4th US Ed., n.d.). Indeed, couple of studies showed to us the contrasting ethical themes relating to General AI, it is still important to note that some of its findings are associated with the liability of data across settings, for example in higher education (Zawacki-Richter et al., 2019), K-12 education (Holstein et al., 2019), schools (Luckin, 2017), amongst others. These studies underscored the issues on informed consent, breach of private information, biased data interpretation, equity, accountability, and over interpretation of data. Moreover, Sacharidis et al. (2020) questioned the impact on the use of AI to surveillance and consent, especially on student's privacy, identity, integrity and inclusiveness (Deshpande et al., 2017).

Teacher and Student vs. AI Comparisons

Student: AI-Human Comparison



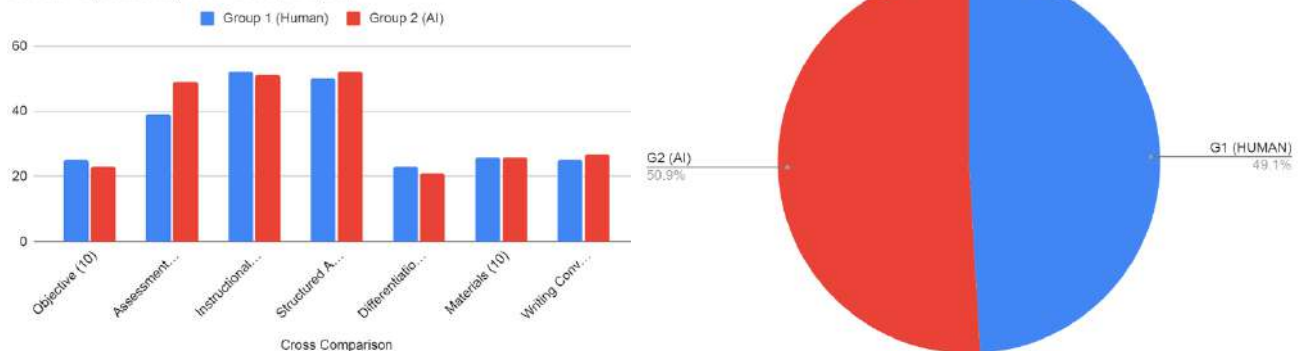
In the cross-comparison of writing skills, Group 1 (AI) scored 81 in Focus and Details, 78 in Organization, 80 in Voice, 74 in Word Choice, and 83 in Sentence Structure, Grammar, Spelling. On the other hand, Group 2 (Human) achieved scores of 82 in Focus and Details, 83 in Organization, 79 in Voice, 83 in Word Choice, and 85 in Sentence Structure, Grammar, Spelling. Overall, Group 2 (Human) performed slightly better than Group 1 (AI) in the areas of Focus and Details, Organization, Word Choice, and Sentence structure; grammar; spelling. While Group 1 (AI) performed better in Voice. Comparing the overall performance, Group 2 (Human) has a higher average score of 51.0%, while Group 1 (AI) achieved an average score of 49.0%. Therefore, based on the given data, Group 2 (Human) outperformed Group 1 (AI) in terms of the overall writing performance.



VIRTUAL REALITY IN SCIENCE EDUCATION: THE DIVERSE PERSPECTIVES AND CONCERNS

Teacher: AI-Human Comparison

Group 1 (Human) and Group 2 (AI)



In the cross-comparison of categories, Group 1 (Human) achieved a score of 25 in the Objective category, 39 in Assessment, 52 in Instructional Strategies, 50 in Structured Application, 23 in Differentiation, 26 in Materials, and 25 in Writing Conventions. On the other hand, Group 2 (AI) obtained scores of 23 in Objective, 49 in Assessment, 51 in Instructional Strategies, 52 in Structured Application, 21 in Differentiation, 26 in Materials, and 27 in Writing Conventions. Group 2 (AI) performed better than Group 1 (Human) in the Assessment, Structured Application, and Writing Conventions. On the other hand, Group 1 (Human) outperformed Group 2 (AI) in the Objectives, Instructional Strategies, Differentiation. But take note that both Groups were tied in scores and both performed better in the Materials. Comparing the overall performance, Group 2 (AI) has a higher total score of 249, while Group 1 (Human) achieved a total score of 240. Therefore, based on the given data, Group 2 (AI) outperformed Group 1 (Human) in terms of the overall performance.



KEY ISSUES OF TECHNOLOGY IN SOUTHEAST ASIA

The thematic paper “Key issues of Technology in Southeast Asia reported by the SEAMEO Regional Center for Educational Innovation and Technology, was commissioned by the Global Education Monitoring Report for the 2023 GEM Report reported that there are four primary issues in

relation to technology and education within Southeast Asian Region (SAR). First, the limited coherence, responsiveness, and relevance of policies and programs on technology. Various Asian Countries implement policies in a broader socio-economic development plan. For example, Vietnam focuses on developing life-long learners, harnessing 21st-century skills, and cultivating personalized learning. Another, Thailand’s National Strategy (2018–2037) emphasized technology integration for enhancing competitiveness and human capital development. Moreover, despite comprehensive policy frameworks, there are persistent issues such as insufficient resources and inadequate capacities of educators, therefore, policies often fail to translate and realize into actionable plans at the ground level due to these limitations. The lack of effective monitoring and evaluation mechanisms to assess the impact of ICT policies. This gap hinders the capacity to make informed decisions and adjustments to policies and programs. Second, inequitable access to appropriate tools and equipment. Significant disparities exist in access to ICT tools between urban and rural areas. For example, there is a very small percentage of schools in rural Cambodia that have the ability to access computer laboratories, and internet connectivity remains to widen the divide. Furthermore, the continued ballooning cost of devices and internet services limit access for marginalized students and communities. Programs like the Philippine Special Education Fund have been instituted to address these issues, but gaps remain. Finally, the Covid-19 brought both good realizations in our ICT infrastructure. Countries innovate open educational resources and enhance online learning platforms, however, the digital divide became more pronounced. Third, inadequate training on technology and pedagogy for teachers and school heads. During the surge of covid-19, the lack of adequate training in ICT for both the leadership team and the faculty unfolded. In Cambodia, training is often limited to basic office skills rather than integrating technology into pedagogy. Moreover, continuous professional development programs are necessary to build teacher’s competencies in using technology for teaching and learning. Finally, as the support for teachers, the policies must center on educators’ training to leverage technology effectively in the classrooms. Lastly, weak monitoring and evaluation mechanisms of ICT in education policies and programs. Various countries still lack comprehensive Monitoring and Evaluation (M&E) frameworks that include specific indicators for ICT in education. This absence makes it difficult to assess the effectiveness of ICT programs and policies. Moreover, even when data is collected, it is not always utilized effectively to inform policy and practice. Indeed, countries need to develop robust systems for data collection, analysis, and utilization. Finally, M&E processes should be designed to provide feedback for continuous improvement of ICT initiatives. This approach will probably help in refining policies and programs to better meet educational goals.



KEY ISSUES OF TECHNOLOGY IN SOUTHEAST ASIA

The matrix provided below offers a comparative overview of the integration of information and communication technology (ICT) in education across six Southeast Asian Countries: Cambodia, the Philippines, Thailand, Vietnam, Timor-Leste, and Singapore. This table not only highlights the common challenges these countries face but also underscores the unique approaches each has taken to address these issues.

UNIQUE ASPECTS			COMMONALITIES
	CAMBODIA	INTERNET CONNECTION AND COMPUTERS FOR STUDENTS	
	PHILIPPINES	SPECIAL EDUCATION FUND, RADIO-BASED INSTRUCTION (RBI)	
	THAILAND	DLTV (DISTANCE LEARNING TELEVISION), NATIONAL STRATEGY (2018-2037)	
	VIETNAM	INTERNET CONNECTION AND COMPUTERS FOR STUDENTS PROGRAM, FOCUS ON DIGITAL LITERACY IN CURRICULUM	
	TIMOR-LESTE	LEARNING PASSPORT PROGRAM, ISEE DATABASE	
	SINGAPORE	SMART NATION INITIATIVE, SINGAPORE STUDENT LEARNING SPACE (SLS)	
			DIGITAL DIVIDE TEACHER TRAINING NEEDS INFRASTRUCTURE CHALLENGES GOVERNMENT INITIATIVES COVID-19 IMPACT

Matrix of Commonalities and Unique Aspects

Source: The author

Across all six nations, there are several shared challenges in implementing ICT in education. One of the most significant issues is the **digital divide**. This divide is particularly pronounced between urban and rural areas, where students in less developed regions often have limited access to technology and educational resources. This disparity creates significant inequalities in educational opportunities. Moreover, **teacher training** is still one of the common challenges for ICT development. Many educators across the Asian Countries remained lacking the skills and confidence to effectively integrate technology into their teaching practices. This professional gap continues to hamper the potential benefits that ICT could bring to education. Furthermore, **infrastructure challenges** are still proliferating in the education arena. Inadequate digital infrastructure, for example unreliable internet source and inaccessibility to necessary devices such as computers and tablets, remains a major border line to effective ICT integration.

Given this situation, Asian countries have recognized the importance of ICT in education and have launched various government initiatives to address issues. However, the effectiveness and availability of the initiatives vary, and ongoing efforts are needed to scale up successful programs. **The Covid-19 pandemic** has underscored the urgency of the effort to improve ICT in education. It highlights the need to adapt to digital learning technologies, exposing existing incapacities of the country for ICT development infrastructure.



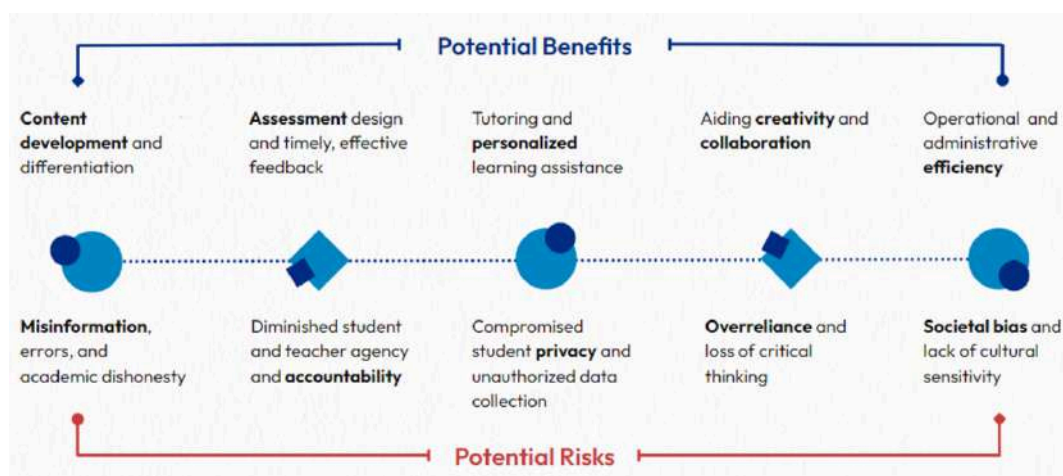
KEY ISSUES OF TECHNOLOGY IN SOUTHEAST ASIA

Vietnam took the path of focusing both infrastructure and digital skills, initiating the “Internet Connection and Computers for Students Program” while embedding digital literacy in the national curriculum. This two pronged approach recognizes the need not only for access to technology but also for the skills to use ICT effectively. Timor-Leste has implemented the “Learning Passport Program” and developed the “iSEE Database” that supports online learning and resource distribution. Finally, Singapore stands out with its advanced “Smart Nation Initiative” and the “Singapore Student Learning Space (SLS)” and online portal providing equitable access to curriculum-aligned resources, following the country’s commitment to deeply integrating technology into its education system.

To sum-up, while these Southeast Asian countries share common challenges in ICT education, such as the digital disparities, teacher training, and infrastructure limitations, they have innovatively shown prowess to withstand challenges by developing unique strategies. Understanding these similarities and differences can help policymakers and educators learn from one another’s experiences, fostering collaboration to improve technology integration in education across the region.

The Benefits and Risk of AI

He who knows only his own side of the case knows little of that.
—John Stuart Mill



Source: Teach AI. Guidance for Schools Toolkit 2023

Personalized learning is one of the primary benefits of using AI. It has the ability to tailor students’ own pace of learning according to their own strengths. Therefore, this tool received considerable attention because of its ability to transform education and offer high-quality education and can also bring advanced learning resources to students regardless of their geographical location. Additionally, AI has the ability to enhance work **efficiency and productivity** in educational settings by automating administrative tasks and providing real-time feedback to students.



KEY ISSUES OF TECHNOLOGY IN SOUTHEAST ASIA

Predictive analytics, is one of the AI features that is able to identify potential challenges that students may face, enabling early interventions that can help prevent academic struggles. Tools like AI can create more engaging learning experiences by incorporating compelling interactive elements and multimedia, making learning more interesting and accessible. Furthermore, there is no doubt that AI could be used to level up the support of lifelong learning and upskilling, allowing individuals to continue their education and acquire new skills beyond traditional academic pathways.

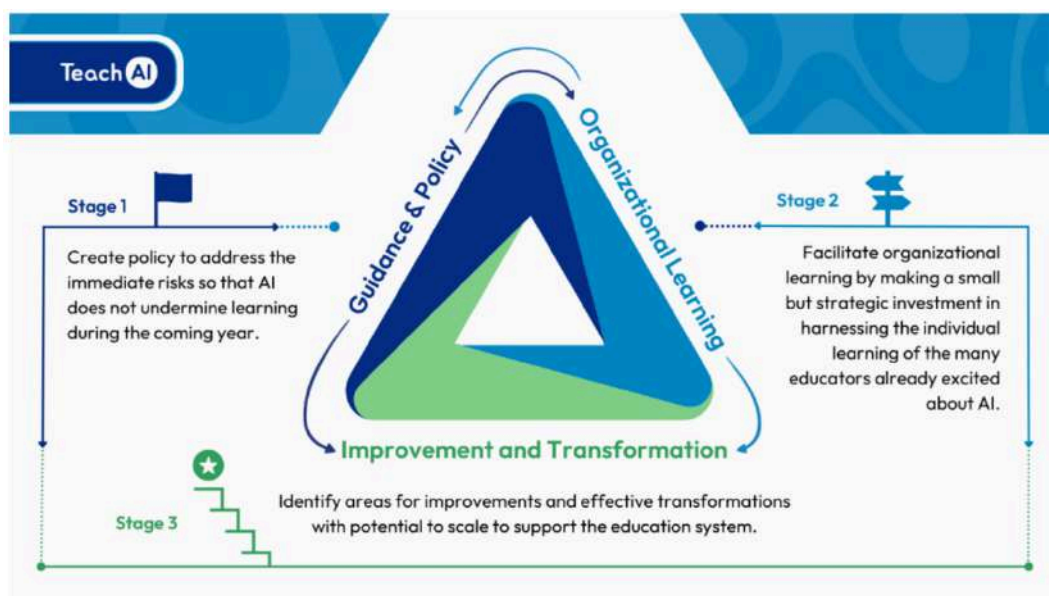
However, these benefits are not without risks. School is more than content, and there is a concern that an emphasis on AI-driven learning might overlook the social, emotional, and developmental aspects of education that occur through human interaction and experiences. The effectiveness of AI is also still dependent on infrastructure, meaning that students in areas with poor internet connectivity or lack of access to digital devices could be left behind. Dependence on AI tools is another risk, as students and educators may rely too heavily on technology, potentially diminishing critical thinking and problem-solving skills that are nurtured through traditional learning methods. There is also the risk of bias and standardized processes being perpetuated by AI, which could lead to unfair or inequitable outcomes for students from diverse backgrounds. Increased screen time is another concern, as it can have negative effects on students' physical and mental health. Lastly, while AI facilitates lifelong learning and upskilling, these achievements may not be traditionally recognized by employers or educational institutions, limiting the perceived value of AI-driven education.

While AI has potential to revolutionize education by offering personalized, efficient, and engaging learning experiences, it is essential to maintain the boundaries with awareness of the associated risks. Addressing these concerns will require thorough integration of AI that enhances, rather than replaces, the human elements of education.



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

Extract guides for Teachers and Students Responsible Use of Artificial Intelligence for Sustainable Education for All



Source: Teach AI. Guidance for Schools Toolkit 2023

The framework from Teach AI. Guidance for Schools Toolkit 2023 outlines a three-stage process for integrating Artificial Intelligence (AI) into education systems, emphasizing the need for prompt action due to the widespread access students and teachers already have to AI through technologies like search engines and email applications. The first stage, Guidance & Policy, involves creating policies to address immediate risks and ensure AI use complies with existing security and privacy regulations, providing clear guidance on responsible and prohibited uses, especially in contexts requiring human oversight, such as maintaining academic integrity. The second stage, Organizational Learning, focuses on facilitating professional development for educators, building their capacity to integrate AI thoughtfully and responsibly into teaching practices. This strategic investment in educator learning supports the broader educational organization in effectively harnessing AI's potential. Finally, the third stage, Improvement and Transformation, aims to use AI to drive significant innovations in education, such as competency-based learning, personalized feedback, and administrative task automation, all while ensuring fair and equitable implementation through supportive policies and continued organizational learning. Together, these stages provide a comprehensive roadmap for transitioning from addressing immediate AI-related concerns to leveraging AI as a catalyst for transformative educational practices.



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

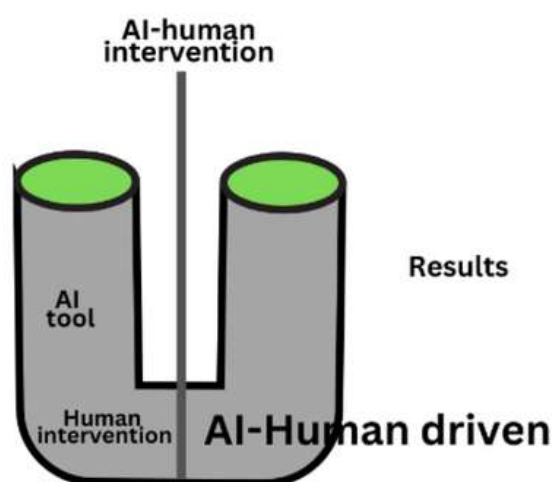
Moreover, during the 2023 Webinar Training for Artificial Intelligence at Unida Christian Colleges (UCC), Aston Queliza outlined the primary objectives of AI guidelines, which include: establishing fundamental rules for the use of AI in educational contexts, demonstrating the application of AI both inside and outside the classroom, and underscoring the importance of maintaining academic integrity when using AI. The guidelines are supported by four key foundations: advancing equity to prevent AI from reinforcing existing biases in education; centering policies around people to ensure that AI supports personal and local decision-making in educational settings; ensuring the safety, ethics, and effectiveness of AI by addressing data privacy and aligning AI use with educational goals; and promoting transparency in AI operations and their impact on students and educational processes.

Teachers are provided with guiding questions to ensure their roles remain central when integrating AI into classrooms. These questions also ensure that AI does not replace human empathy or decision-making, and that there are mechanisms in place to monitor AI usage and intervene when necessary. Teachers and school leaders are encouraged to receive adequate training to understand the AI systems in use. Additional policies emphasize the need to monitor how AI tools collect and use student data, ensuring that AI remains a supportive tool rather than a substitute for teacher responsibilities, and promoting transparency and collaboration among educators.

For students, the guidelines include a checklist to help them use AI responsibly. This includes ensuring that the AI tools they use comply with school policies, do not harm others or compromise personal information, and avoiding the use of AI tools during assessments to uphold academic integrity. Students are also advised to be cautious when using AI-generated content, ensuring proper verification to avoid plagiarism and cheating (Queliza, 2023).

On the same hand, Vidal and Ramos (2023) used a metaphor similar to the osmotic effect in biology, where balance is achieved through the movement of molecules across a membrane, to illustrate the ideal relationship between AI tools and human intervention in education. The concept here is that AI should be integrated into the educational environment in a way that enhances learning without overshadowing the essential role of teachers.

On the left side of the diagram, AI tools, like ChatGPT, and other educational technologies are represented. These tools are valuable resources that can support learning, but their use must be carefully managed by educators. The diagram emphasizes a crucial point: AI should not operate independently in the classroom; rather, it requires the continuous involvement and oversight of teachers. This human intervention ensures that AI tools are used ethically and effectively, helping to guide students towards meaningful and accurate outcomes.



Source: From the Author



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

The fine line between AI and human intervention in the diagram represents the balance that must be maintained. AI should not become the focal point of the learning process but should serve as a tool that complements and enhances the educational experience. Teachers play a critical role in this balance by ensuring that students understand both the benefits and limitations of AI. They must guide students in using AI responsibly, making sure that the results produced are not solely AI-driven but are instead a collaborative outcome where human judgment and critical thinking are central.

In terms of ethics and maintaining integrity, this balanced approach is crucial. Teachers must ensure that AI is used to support learning rather than replace it, safeguarding against overreliance on technology. This approach helps maintain academic integrity by ensuring that students do not become dependent on AI for their work but instead use it as a tool to aid their learning, with the teacher's guidance ensuring that the final results reflect a well-rounded, human-driven understanding.



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AI Implementation in Education

Implementing AI in education requires a multifaceted approach that includes careful planning, infrastructure construction, training, and ongoing evaluation. Here's a step-by-step method for effectively utilizing AI in educational settings:

ESTABLISH CLEAR OBJECTIVES

- **Identify Goals:** Begin by determining what you want to achieve with AI in education. This could include personalized learning, automating administrative tasks, improving student engagement, or enhancing learning outcomes.
- **Focus on Student and Teacher Needs:** Ensure that AI solutions align with the needs of students and teachers, such as reducing workload, providing instant feedback, or supporting diverse learning styles.

1

2

DEVELOP AI POLICIES AND GUIDELINES

- **Create Ethical Guidelines:** Establish policies to ensure the ethical use of AI, addressing issues like data privacy, bias, and transparency. Ensure that AI tools comply with existing educational policies and regulations.
- **Define Responsible Use:** Clearly outline the roles of AI in education, specifying what AI can and cannot do, and ensure human oversight, especially in decision-making processes related to student evaluation and academic integrity.



INVEST IN INFRASTRUCTURE

- **Ensure Technological Readiness:** Upgrade necessary infrastructure, including reliable internet access, secure data storage, and devices capable of running AI applications.
- **Integrate AI Tools:** Choose AI tools and platforms that meet the identified educational objectives, whether for classroom management, personalized learning paths, or administrative automation.

3



PROVIDE PROFESSIONAL DEVELOPMENT

- **Train Educators:** Offer comprehensive training for teachers and school leaders on how to use AI tools effectively and responsibly. Training should cover both the technical aspects and the pedagogical integration of AI.
- **Promote Continuous Learning:** Encourage educators to stay updated on AI developments and continuously refine their skills through workshops, seminars, and online courses.

4





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PILOT AI PROGRAMS

- **Start Small:** Begin with pilot programs to test AI tools in specific classrooms or schools. Use these pilots to gather data on effectiveness, user experience, and any challenges encountered.
- **Collect Feedback:** Engage with teachers, students, and parents to collect feedback on the AI tools, adjusting the implementation based on their experiences and suggestions.

FOCUS ON EQUITY AND ACCESSIBILITY

- **Bridge the Digital Divide:** Ensure that all students have access to the necessary technology and that AI tools are designed to be inclusive, catering to students with diverse needs and backgrounds.
- **Monitor for Bias:** Regularly review AI algorithms for any signs of bias that could disadvantage certain groups of students, and adjust them to promote fairness.

ENSURE ONGOING SUPPORT AND MAINTENANCE

8

- **Provide Technical Support:** Set up a support system for troubleshooting and resolving issues with AI tools to minimize disruptions in the educational process.
- **Update AI Tools:** Regularly update AI tools to incorporate new features, improve functionality, and address any identified shortcomings.

6

7

EVALUATE AND SCALE

- **Assess Impact:** Continuously evaluate the impact of AI on learning outcomes, teacher satisfaction, and overall educational efficiency. Use metrics and data analytics to measure success.
- **Scale Up:** Once proven effective, gradually scale AI implementations across more classrooms or schools, while maintaining flexibility to adapt to new challenges or technologies.



FOSTER A CULTURE OF INNOVATION

- **Encourage Experimentation:** Promote a culture where educators and students feel empowered to experiment with AI tools to explore new ways of learning and teaching.
- **Share Best Practices:** Create platforms for educators to share their experiences and best practices with AI, fostering a community of learning and continuous improvement.

9



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

Guidance on the Use of AI in the Schools

Purpose

This document is to provide light and initial guidance to teachers, staff and school communities on the appropriate use of emerging technologies introduced all over the world, just like ChatGPT among others. These guidelines, however, are not going to be the finite basis but could be one of the few other examples we can borrow online.

Artificial Intelligence, in layman's terms, functions the same as google that provides information on the questions both answered, proven, and explored knowledge. However, what makes them separate is that AI, on the other hand, makes convenient for extracting information by just making a prompts (in any form of sentence construction, though couple of studies suggest that the clear, concise the inquiry prompted the better the results, and expected outcome) and will give you a complete set of information, in even sometimes suggest and recommend information about the queries being asked. As these technologies progress, it becomes more intricate and catering to the demands of the public, it does not just provide a text but generates images, unique contents, and or music based on patterns they have learned from the training data--machine learning.

Scope

This guidance applies to all students, teachers and staff , administrators, and stakeholders who have the capacity to develop, implement, or interact with AI technologies in our education system. This could cover all across emerging technologies, but not limited to generative AI models, intelligent tutoring systems (ITS), conversational agents, automation software, and analytics tools. This guidance should complement the existing policies on technology use, data protection, academic integrity, and student support.

a. AI should help students advance learning. The use of AI, or in any form of technologies, should not hinder any single students, and should never be the reason for widening any form of biases, and underrepresented marginalized sectors. To be more precise, these tools should be easily available and accessible to teachers, students, and guardians.

b. Strict adherence to existing policies and regulations. The use of AI should not create a silo specialised guidance as it should complement any other existing rules and regulations on the use of technologies. These rules and regulations should protect student privacy, ensure accessibility to all kinds of learners, and should be free from harm.

c. For Quality and Literacy. All personnel, including parents, staff and stakeholders should receive proper training and correct information on the use of these technologies. Teachers and students, on the other hand, should just receive training, but should practice cordial and open communication to build trust and confidence to responsibly use Artificial Intelligence both inside and outside the classroom.



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d. Academic Integrity. Honesty, trust, fairness, respect, and responsibility continue to be the center of discussion for both the teachers and students. Moreover, the students should be truthful in giving credit to the sources and tools and honest in presenting work that is genuinely their own for evaluation, otherwise, considered dishonesty and to some extent a violation of academic integrity. On the same hand, the teacher should be precise in giving expectations and limitations on the use of this AI, and should never use, introduce nor allow any of these tools, if he/she alone is not knowledgeable on it.

e. Auditing, Evaluating and Monitoring. Technology's progress is as fast as a blink of an eye, therefore, keen monitoring is utmost needed. Frequent and regular reviews and updates of the policies, procedures, and practices should be considered.

Responsible Use of AI Tools

All schools recognise that responsible use of AI varies depending on the context, such as a classroom activity or assignment. Teachers will clarify if, when, and how AI tools will be used, with input from students and families, until the laws for this are yet to be approved, the schools' regulations on data security and privacy the initiative should remain intact. Below are the examples of responsible uses that serve educational goals.

Students' Learning

- **Aiding creativity:** Student can harness generative AI to spark creativity across diverse subjects, including writing, visual arts, and music composition
- **Collaboration:** Generative AI tools can partner with students in group projects by contributing concepts, supplying research support, and identifying relationships between varied information, please note that these collaboration should have boundaries on which part of the research area can a student be allowed to use of AI, and it must be disclosed on how it was used to generate information.
- **Communication:** AI can offer student real-time translation, personalised language exercises, and interactive dialogue simulations.
- **Content creation and enhancement:** AI can generate personalized learning materials, summaries, quizzes, and visual aids, help students organise thoughts and contents and help review content.
- **Tutoring:** Emerging Technologies like AI have a potential to democratise one-on-one tutoring and support, making personalised learning more accessible to a broader range of students. However, this is where the parents and guardians come into the picture, as this information generated by the machine is exact, correct, and this might harm the learning process instead of ensuring objectives being met. Information generated from the machine or tools should be verified.



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Teacher Support

- **Assessment Design and analysis:** Generative AI can be helpful in formulating or designing assessments, questions, and for standardised feedback for common errors, AI can be of help for conducting diagnostic assessments to help identify certain areas that a student can develop as the class progresses. Moreover, teachers will be ultimately responsible for feedback, evaluation, and grading, also maintaining academic integrity and the AI's usefulness in supporting the grading work, however, AI will not solely be responsible for grading.
- **Content Development and Enhancement for Differentiation:** AI can assist teachers by enhancing curricula be it by content, assessment, intervention or differentiation to enhance the learning experience of the learners.
- **Professional Development:** Teachers are the main implementers and the managers of the AI once inserted in the learning process inside the classroom, therefore, simulation-based training is a must.
- **Research and Resource Compilation:** AI can be of great help by recommending books, or reading materials and articles to a lesson and updating teachers on teaching techniques, research and methods.

School Management Operations

- **Communication:** AI can streamline communications within the school community by the help of chatbots for frequently asked questions, and provide instant language translation.
- **Operational Efficiency:** School functional teams can use AI to support streamline operations for administrative processes, for example the scheduling courses, automating inventory management, increasing energy savings, and performance data visualizations.

Prohibited Use of AI Tools

As the path of understanding the use of AI in education is slowly getting clear, this paper recognised the risk and harm it posed, therefore, this guidelines will try to provide measurements on the areas to be high risk for Academic Integrity.

Students' Learning

- **Bullying/harassment:** Using AI to impersonate others for bullying, harassment, or any form of intimidation is strictly prohibited. All users, teachers and students, are expected to exercise utmost responsibility to use AI for educational purposes, upholding values of respect, inclusivity, and academic integrity at all times.
- **Overreliance:** Too reliant on AI tools can decrease interaction which is important in the learning process, it will also increase the risk of compromising academic integrity across possibilities. Therefore, teachers should help clarify if, when, and how AI tools should be used inside and outside the classroom, and teachers and students are expected to review outputs generated by AI before use.



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

- **Plagiarism and Cheating:** Directly copying or lifting any form of intellectual property including the sources generated by AI is considered plagiarism and cheating, without proper approval, citation, and adequate documentation. Students should not submit AI-generated work as their original work. Staff and students should be taught on how to properly cite, document, disclose, and acknowledge the use of AI where applicable. Teachers, on the same hand, should be clear about when and how can students utilize AI on the assignments and restructure assignments to reduce the margin of plagiarism by requiring personal context, original arguments, or original data collection.
- **Access to all restricted to None:** The tools, if allowed to certain points, should be accessible to all kinds of students, considering that some may or may not have access to such resources outside of school.

Teacher Support

- **Societal Bias:** AI systems that are taught on data from humans will naturally highlight societal biases in the data. Hazards encompass fortifying preconceived notions, suggesting unsuitable pedagogical measures, or rendering biased assessments, including fraudulently disclosing work committed by non-native english speakers as plagiarism. Humans will examine all AI-generated outputs before usage, staff and students will be trained to comprehend the causes and effects of societal bias in diversity of their training data.
- **Sense of ownership and accountability:** It is very obvious that AI can be a great help for both teachers and students—it boosts what teachers can do and enlightens the workload. However, do remember that AI can never replace what humans can do to his/her students. Teaching, inspiring and monitoring are very personal that belong to the teacher not machines. AI is available to enhance learning experience, make better decisions and not to take them over (Artificial Intelligence, 2023).
- **Privacy Matter:** AI tools should never be used to track students and teachers tabs and movements. Doing it would violate the privacy of everyone involved and could lead to a culture of constant surveillance, which isn't healthy for learning and teaching. Respecting privacy is about creating an environment where students and teachers feel safe and trusted.

Promoting Academic Integrity

Academic challenges like plagiarism and other threats to academic integrity, AI can also be a powerful tool in reinforcing its core principles—honesty, trust, fairness, respect, and responsibility.

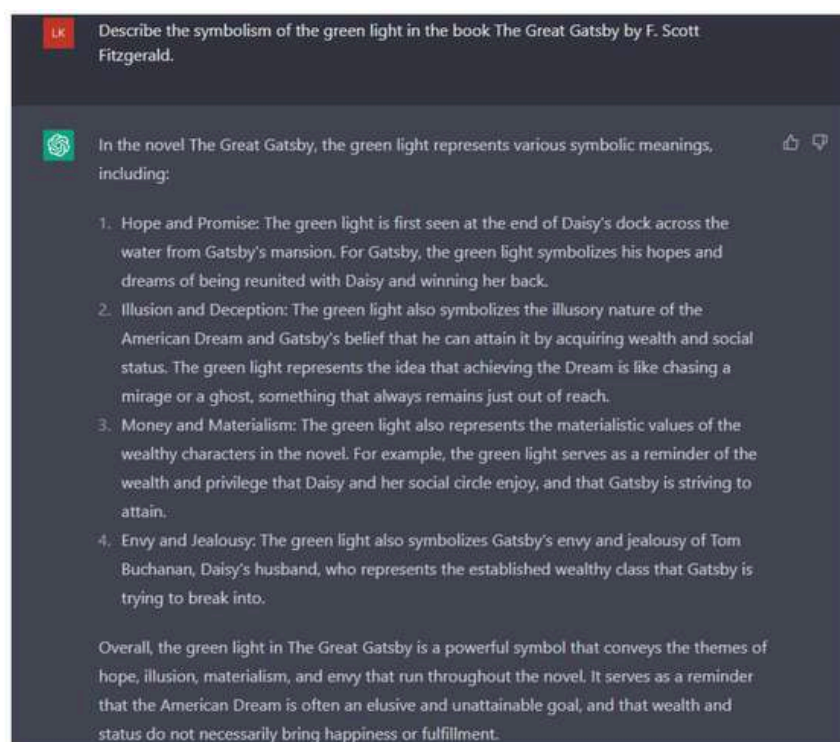
- Both staff and students can use AI to verify information quickly, but they must remain critical thinkers and carefully evaluate the results.
- AI also supports fairness by helping identify and reduce biases in grading assessments. Additionally it can adapt learning materials to suit diverse needs, respecting the unique learning styles and abilities of every student.



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- Teachers could permit the use of generative AI for certain assignments or specific sections of an assignment, making clear why it is not appropriate for others.
- Teachers should avoid using tools that claim to detect generative AI usage for identifying cheating or plagiarism, as these tools often lack reliability. Whenever a teacher or student uses an AI system, its use must be openly acknowledged and explained. Students can also cite their use of AI systems using recommended resources as part of their disclosure process.

Example: **Paraphrasing Text**



Source: From MLA Style Center

Paraphrased in Your Prose

While the green light in *The Great Gatsby* might be said to chiefly symbolize four main things: optimism, the unattainability of the American dream, greed, and covetousness ("Describe the symbolism"), arguably the most important—the one that ties all four themes together—is greed.

Works-Cited-List Entry

"Describe the symbolism of the green light in the book *The Great Gatsby* by F. Scott Fitzgerald" prompt. *ChatGPT*, 13 Feb. version, OpenAI, 8 Mar. 2023, chat.openai.com/chat.

And more examples for MLA Styles: [Quoting Text](#), [Citing Visual Works](#), [Textual Works](#), [Secondary Sources](#), [etc.](#) Examples for [APA Styles](#), and [Chicago Styles](#).



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

Sample Letter to Parents on the use of AI

This sample is extracted from the “AI Guidance for Schools Toolkit_TeachAI” and is intended solely as a reference for drafting communications to parents. Any reproduction or use of this sample, in whole or in part, is at the sole discretion and responsibility of the sender.

Dear Parents and Guardians,

As emerging technologies like artificial intelligence (AI) become more prevalent, our school is proactively developing principles to guide the safe, effective, and responsible use of these tools for student learning. After careful consideration, we have established the following principles:

1. Support Education Goals for All: AI will be thoughtfully used to enhance outcomes for every student.
2. Privacy & Security: AI use will align with regulations protecting student data privacy, safety, and accessibility.
3. AI Literacy: Students and teachers will build skills to critically evaluate and utilize AI technologies ethically.
4. Realize Benefits & Address Risks: We will cautiously explore AI benefits while proactively addressing risks.
5. Academic Integrity: Students will produce original work and properly credit sources, including AI tools.
6. Maintain Human Agency: AI will provide support, not replace educator and student discretion in decisions. Our staff will set parameters for each class and assignment for when and how AI systems can be used.
7. Continuous Evaluation: We will routinely audit AI use, updating policies and training as needed.

We remind parents and guardians that AI tools may have age restrictions. For example, ChatGPT currently requires users to be at least 13 years old and requires parental or legal guardian consent for students between the ages of 13 and 18. The website warns that “ChatGPT may produce output that is not appropriate for all audiences or all ages and educators should be mindful of that while using it with students or in classroom contexts.”

Our goal is to create a learning environment where AI technologies empower rather than replace the human aspects of education. We embrace these technologies cautiously to prepare students for a future where these technologies are everywhere. Please reach out with any questions or input on these principles as we navigate this rapidly changing terrain together. We thank you for your support.

Sincerely,
Name



GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE CLASSROOM

Sample Letter to Parents, Staff on the use of AI

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Dear Teachers and Staff,

Artificial intelligence (AI) can transform our schools in exciting ways, but we must also mitigate the risks. Below are a few examples of responsible and prohibited uses of AI. Throughout the rest of the school year, we will be providing ongoing PD opportunities.

Examples of Responsible Uses of AI

Student Learning:

- **Aiding Creativity:** Students can harness generative AI to spark creativity across diverse subjects, including writing, visual arts, and music composition.
- **Content creation and enhancement:** AI can help generate personalized study materials, summaries, quizzes, and visual aids, help students organize thoughts and content, and help review content.

Teacher Support:

- **Assessment Design and Analysis.** AI can enhance assessment by creating questions and providing standardized feedback on common mistakes. Teachers will ultimately be responsible for evaluation, feedback, and grading, including determining and assessing the usefulness of AI in supporting their grading work. AI will not be solely responsible for grading.
- **Content Differentiation.** AI can assist educators by differentiating curricula, suggesting lesson plans, generating diagrams and charts, and customizing independent practice based on student needs and proficiency levels.

Responsible use of AI in the classroom may vary. For example, AI may only be appropriate for some graded assignments. I encourage you to discuss AI use with your students.

Examples of Prohibited Uses of AI

Student Learning:

- **Bullying/harassment:** The use of AI tools to create deepfakes, manipulate media, or impersonate others for bullying, harassment, or any form of intimidation is strictly prohibited. All users are expected to employ these tools



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- solely for educational purposes, upholding values of respect, inclusivity, and academic integrity at all times.
- Plagiarism and cheating: Students and staff should not copy from any source, including generative AI, without prior approval and adequate documentation. Students should not submit AI-generated work as their original work. Teachers will be clear about when and how AI tools may be used to complete assignments and restructure assignments to reduce opportunities for plagiarism. Existing procedures related to potential violations of our Academic Integrity Policy will continue to be applied.

Teacher Support:

- Bias: AI tools trained on human data will inherently reflect societal biases in the data. Risks include reinforcing stereotypes, recommending inappropriate educational interventions, or making discriminatory evaluations, such as falsely reporting plagiarism by non-native English speakers. Staff and students will be taught to understand the origin and implications of bias in AI, AI tools will be evaluated for the diversity of their training data and transparency, and humans will review all AI-generated outputs before use.
- Diminishing student and teacher agency and accountability: AI technologies will not be used to supplant the role of human educators in instructing and nurturing students. AI is a supporting tool to augment human judgment, not replace it. Teachers and staff must review and critically reflect on all AI-generated content before use.

We will continue to ensure that data privacy and security are top priorities and will continue to approve software according to updated policies that include AI. Staff and students are prohibited from entering confidential or personally identifiable information into unauthorized AI tools, such as those without approved data privacy agreements. For more information, please read our complete guidance [\[insert link\]](#) on using AI in education, which includes a sample student agreement for AI in the classroom. We will also be providing ongoing PD opportunities throughout the school year.

Sincerely,

[Name]



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Sample Student Agreement on the use of AI

Teachers may encourage responsible AI use by requiring students to sign agreements outlining appropriate practices. These agreements can be integrated into a class syllabus or used as standalone student contracts. In some cases, teachers have facilitated class activities to collaboratively develop these agreements with students, promoting AI literacy.

Disclosure

This sample is directly borrowed from the “AI Guidance for Schools Toolkit_TeachAI” and is intended solely as a reference. Any reproduction or use of this sample, in whole or in part, is at the personal discretion and responsibility of the user. It should be customized to suit the specific needs of the classroom or institution.

Artificial intelligence (AI) can help me learn better and is important for my future, so I promise to use it responsibly and make smart choices.

1. I will use AI tools responsibly and will not use AI in a way that could harm myself or others.
2. I will not share personal or confidential information with an AI tool.
3. I will only use AI to support my learning and will follow my school's rules and teacher's instructions on when and how to use AI on an assignment.
4. I will be honest about when I use AI to help with assignments, and I will not turn in work that is fully created by an AI as my own.
5. If I use AI, I will review its work for mistakes.
6. I will check with my teacher when unsure about what is acceptable.

Student Signature: _____

Note: Sample language to consider when reviewing your class syllabus: AI tools may be used for brainstorming or preliminary research, but using AI to generate answers or complete assignments without proper citation or passing off AI-generated content as one's own is considered plagiarism.

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ABOUT THE *Editor*

Joshua Vidal



Joshua Vidal is a license teacher, an educator, researcher, and leader in the field of science and technology education. Vidal holds a Master of Arts in Social Science, Master of Arts in Education, and received Doctor of Education-Honoris Causa, and now pursuing his Doctorate of Philosophy in Public Administration. Also, he is a Research Scientist Fellow at the Science Department of Unida Christian Colleges (UCC), where he leads initiatives that enhance science education through innovative research and the integration of technology. Vidal serves as the Editor-in-Chief of the Electronic Paper for Science and Technology Education, which publishes groundbreaking articles on educational innovations. His work emphasizes resilience and forward-thinking in education, with notable publications such as "Systems Thinking in Education: Its Application in a D-VUCA World" (2023), "Emerging Technologies: The Birth of Artificial Intelligence (AI) in Education" (2023), and "Propose Curriculum Planning and Management Model Towards Timely and Resilient Education Curriculum in the Philippines" (2023). His current research project, "Positive Education: Investigating Brain Plasticity and Its Effect on Academic Performance," explores how positive educational practices influence brain adaptability and enhance student outcomes.

Beyond academe, Vidal contributes to the Coastal Cities at Risk Philippines (CCARPH) project at Ateneo de Manila University, focusing on systemic resilience in education and urban sustainability. He also collaborates with many organizations like the Cavite Sky Observers, bringing hands-on astronomical experiences to students through events such as the 2022 total lunar eclipse observation. Vidal's multifaceted roles position him as a key influencer in shaping resilient, technology-driven educational strategies that prepare students and educators for the complexities of the modern world.



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